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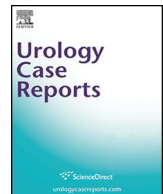


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Trauma and reconstruction

Renal pseudoaneurysms and pulmonary embolism: A unique manifestation of complications following blunt renal trauma



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ABSTRACT

This case report presents a unique manifestation of complications in a 71-year-old man following blunt renal trauma. Initially, computed tomography (CT) revealed a traumatic left kidney laceration. Hematuria ceased quickly after ureteral stent placement. One week later, hematuria reoccurred while the patient was treated for pulmonary embolism. Multiphase CT revealed two renal pseudoaneurysms as the underlying cause. Renal pseudoaneurysms are commonly associated with surgery or inflammation and rarely seen after trauma. Selective angiographic embolization successfully stopped hematuria. Thereafter, the patient was hemodynamically stable to continue therapeutic thrombolysis. After discharge, the patient remained symptom-free and had an unremarkable follow up assessment.

Introduction

Renal injuries account for up to 5% of all traumas.¹ Blunt trauma, the most dominant cause for renal injuries, includes falls, motor vehicle accidents and pedestrians hit by motor vehicles.¹ In addition, penetrating injuries, such as stab or gunshot wounds, pose a serious health threat as they tend to be more severe than blunt traumas.¹ According to the American Association for the Surgery of Trauma severity scale, injuries can range from a contusion or subcapsular, nonexpanding hematoma without parenchymal laceration (grade I) to a completely shattered kidney (grade V).²

Renal pseudoaneurysms (RPA) are rarely seen following blunt renal trauma but are commonly associated with surgery or inflammatory processes.^{3,4} Herein, we present a unique manifestation of complications in one man following blunt renal trauma. He underwent successful selective angiographic embolization of two RPA although being on therapeutic thrombolysis for segmental pulmonary embolism.

Case report

A 71-year-old male presented with left flank pain and gross hematuria following a motorcycle accident. He had a history of a non-ST-elevation myocardial infarction, which required percutaneous coronary

intervention of the ramus circumflex artery the year prior to this event. On examination, the patient was hemodynamically stable (i.e. blood pressure 148/81 mmHg, heart rate 55 bpm) and alert. Initial blood biochemistry showed normal values for hemoglobin (131g/L), sodium (142mmol/L), potassium (4.0mmol/L), creatinine (101μmol/L) and prothrombin time (92%). Computed tomography (CT) confirmed a posterior-inferior left kidney laceration of 1.5 cm (grade IV, Fig. 1A) adjacent to the collecting system and a retroperitoneal hematoma (7 × 4 × 7cm). Primary conservative management was initiated and a transurethral irrigation catheter was placed. As gross hematuria and left flank pain persisted for the next 4 days, CT was repeated and a ureteral stent was inserted to maintain urinary outflow from the left kidney. Thereafter, hematuria regressed intermediately.

One week after admission, a segmental pulmonary embolism of the right lung was detected. Thus, therapeutic thrombolysis with unfractionated heparin was commenced immediately. As a negative side effect, gross hematuria reoccurred and left the patient anemic (i.e. hemoglobin 73g/L). After transfusion of two units of packed red blood cells, multiphase CT was conducted to find a potential underlying cause. Two hyperdense lesions of the left kidney [i.e. mid renal parenchyma (1.4cm) and lower pole (1.9cm)] were found, suggesting the development of posttraumatic RPA (Figs. 1B and 2A). Selective angiographic embolization of subsegmental arterial branches (Fig. 2B and C)

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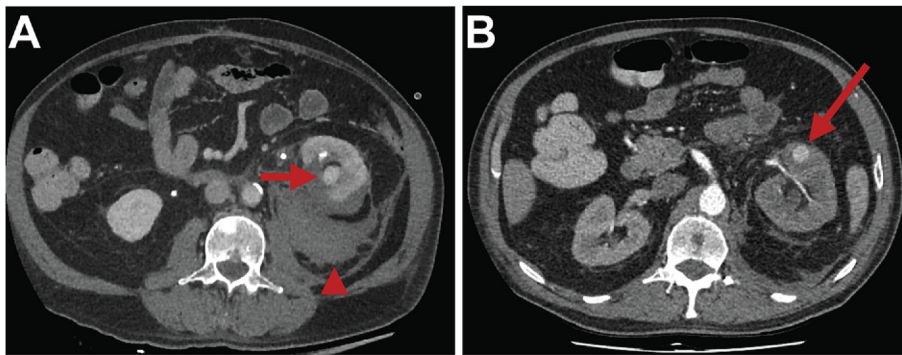


Fig. 1. (A) Computed tomography revealing a laceration of the left kidney with adjacent retroperitoneal hematoma (arrowhead) during the initial venous phase with a contrast-enhancing structure in renal sinus of left lower kidney (arrow). (B) Follow-up computed tomography showing the upper renal pseudoaneurysm of left kidney during the arterial phase (arrow).

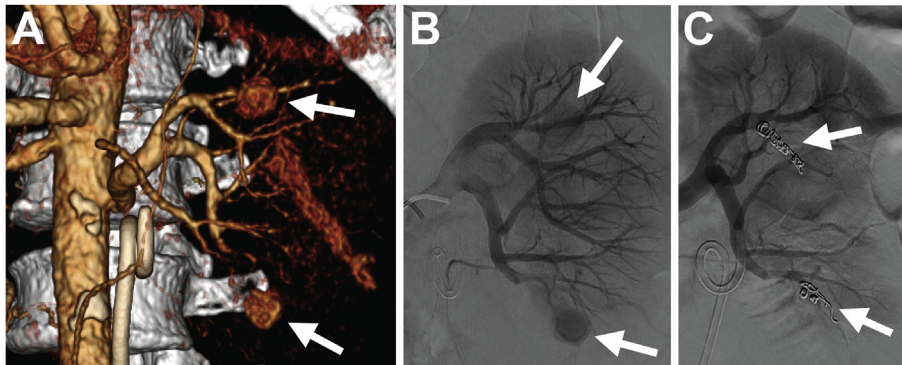


Fig. 2. (A) 3D computed tomography reconstruction displaying both renal pseudoaneurysms in the upper and lower part of the left kidney (arrows). (B) Angiography confirms the two renal pseudoaneurysms (arrows). (C) Final angiographic image with microcoils in place (arrows) demonstrates successful occlusion of subsegmental renal arteries.

was successfully executed using a microcatheter and platinum-fibered microcoils (Cook Medical, Bloomington, Indiana, USA). The following postoperative course was uneventful. The patient remained hemodynamically stable. While gross hematuria ceased immediately, therapeutic thrombolysis was adjusted and continued successfully with rivaroxaban. A few days later, the patient was discharged in good condition.

The patient remained symptom-free, when he returned for an unremarkable three-month follow-up assessment. One year later, neither blood biochemistry (i.e. creatinine 99 $\mu\text{mol/L}$), blood pressure (i.e. 125/70 mmHg) nor renal ultrasound (i.e. normal kidney perfusion without any sign of upper tract obstruction or residual hematoma) indicated any signs of deterioration. Since then, the patient has been regularly seen by his general practitioner. Most recently (i.e. 3 years post-injury), his blood pressure (i.e. 140/95 mmHg) and creatinine level (118 $\mu\text{mol/L}$) were slightly elevated.

Discussion

The European Association of Urology (EAU) guideline on urological trauma strongly recommends testing for hematuria after any renal trauma.¹ Contrast enhanced CT is the preferred imaging technique in hemodynamically stable patients to detect tissue or vascular damage following penetrating or blunt renal trauma [level of evidence (LE) 3].¹ With a high success rate (up to 90%), conservative (i.e. non-operative) management with close surveillance of vital signs is the treatment of choice in hemodynamic stable patients suffering from blunt renal trauma (LE 3).¹

In case of worsening of the patient's condition, such as increased flank pain, blood loss or fever, diagnostic imaging should be repeated (LE 3).¹ In line with the latter, CT revealed RPA as the underlying cause for recurrent gross hematuria in our case. RPA are rare and usually associated with surgery, malignant and inflammatory processes.³ Yet, they are rarely seen after blunt renal trauma.⁴ Typically, gross hematuria is found days or even weeks after initial injury and potentially rendering the patient hemodynamic instable.³ While CT is considered

as the gold standard for early detection of RPAs, selective angiographic embolization is the preferred minimal-invasive treatment option.^{1,3} In our case, primary selective angiographic embolization was successful to stop gross hematuria permanently.

After an uneventful postoperative recovery, patients can be discharged and scheduled for a routine follow up three months after the initial renal injury. As recommended by the EAU, this appointment should include a physical examination, urinalysis, individualized imaging, blood pressure measurements and renal function tests (LE 3).¹ Follow up examinations should be continued until healing process is fully completed.¹ In our case, follow up assessment confirmed complete recovery of the patient three months post-surgery. Considering the coronary heart disease as well as the slightly elevated blood pressure and creatinine level, the patient will undergo thorough yearly follow-up evaluations.

The current literature on long-term outcome after renal trauma is limited, however patients should be monitored closely as there is a risk, albeit small (5%) to develop post traumatic renal hypertension, which can persist long-term.¹ Patients with low grade injury (grade I-II) have a high chance for a complete recovery without any detectable residual during follow up CT.⁵ In contrast, attention should be given to patients with more severe renal injuries as they have a high chance to develop renal scars with subsequent loss of kidney function (i.e. 64% for grade III and 100% for grade IV and V).⁵

Conclusion

Hematuria is a frequent finding in patients after blunt renal trauma. Although RPA are usually associated with a non-traumatic development, they can present themselves as a rare complication after blunt renal trauma. While CT is the preferred imaging technique to detect RPA, selective angiographic embolization is the treatment of choice for intermittent severe hematuria. Follow-up is highly advised to document complete healing or detect any deterioration such as impaired renal function or renal hypertension.

Conflicts of interest

None of the contributing authors has any conflict of interest, including specific financial interest or relationships and affiliations relevant to the subject matter or materials discussed in the manuscript.

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